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SOURCE Radio, No 7, 1950, p 59.A VACUUM-TUBE VOLTMETER USING A 6E5 TUBE

G. Kalinkin

The attention of radio amateurs is invited to a very simple form of vacuum-tube voltmeter using a 6E5 tube which measures both alternating and direct voltages (see appended diagram).

The circuit operates as follows: When the sliding contact of the potentiometer R_1 is set at the uppermost position, the grid bias is zero and the shaded area of the tube is maximum (zero of the voltmeter). The voltage to be measured is applied to the grid of the 6E5 tube so that the bias becomes negative, and the shaded area contracts. At a given value of this voltage, depending upon the rectifier voltage, the shaded area narrows to a thin line. For example, when $U_a = 250$ v, the shaded area becomes a thin line when the grid bias reaches -8 v. If the voltage to be measured is less than -8 v, a shaded area still remains. In this case, additional negative voltage is applied by changing the potentiometer resistance R_1 until the shaded area becomes a thin line. Thus, it is possible to graduate the voltmeter scale by the position of the sliding contact of the potentiometer R_1 .

Alternating voltage is applied to the same voltmeter terminals and rectified by the grid-cathode section of the 6E5 tube. As a result, the grid becomes negative and the shaded area contracts to a certain limit -- depending on the magnitude of the alternating voltage to be measured. By contracting the shaded area to a thin line, using the potentiometer R_1 , it is possible to graduate the scale in volts for alternating voltage.

This method is somewhat unusual, but it greatly simplifies the voltmeter, since the one variable resistance in the cathode circuit serves both to zero the voltmeter and to measure the voltage. Besides, this circuit makes it possible to measure alternating voltage without additional rectifiers.

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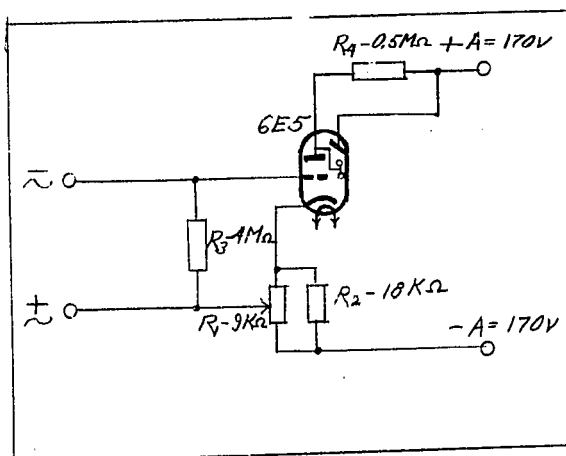
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The error of measurements is closely related to the variation of rectifier voltage, and, therefore, a voltage regulator should be used in the circuit. If there is no voltage regulator, the voltage in the circuit can be regulated with the help of the 6E5 tube itself. To do this, it is necessary to see that the shaded area has contracted to a thin line when the slide of the potentiometer R_1 is moved to the lowest position. This can be done by changing the line voltage, using an autotransformer. After this is done, the voltmeter can be graduated by the method described.

Use of the circuit described above is recommended to radio amateurs who wish to construct a bridge from the description of Nekhayevskiy's exhibit (see, Radio, No 2, 1949). It does not require additional parts and the resistor R_1 will serve for both regulating the sensitivity of the 6E5 tube and measuring the voltage. The author made such a combination instrument to measure resistance, capacitance, and voltage. The range of measurements is 0-3 μ dc, and 0-2.4 v ac for $U_a = 170$ v.

Since the input resistance of the voltmeter is very high, it can be used to measure voltage in any radio circuit and to check the operation of the AVC line. The instrument can also be used as a resonance indicator when tuning circuits. The range of measurements can be increased by using a voltage divider.

[Appended figure follows.]



6E5 Vacuum-Tube Voltmeter

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